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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER

SINGH, PREM C

ART UNIT

PAPER NUMBER

1797

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/551,212	Applicant(s) BEREZUTSKIY, VLADIMIR MIKHAILOVICH	
	Examiner PREM C. SINGH	Art Unit 1797	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 03 June 2010.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1, 11, 18-23, 26-40, 42, 43, 45, 46 and 48-61 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1, 11, 18-23, 26-40, 42, 43, 45, 46 and 48-61 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 06/03/2010 has been entered.

Specification

2. The spacing of the lines of the specification is such as to make reading difficult. New application papers with lines 1½ or double spaced on good quality paper are required.

Claim Objections

3. Claims 19 is objected to because of the following informalities:

Claim 19 cites, "The method of claim, wherein the host liquid media is a"

Claim number is missing.

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Claim 1 cites, "liquid media" and not "host liquid media". Consistent terminology should be used.

Appropriate correction is required.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

5. Claims 1,11, 18, 20-23, 26-40, 42, 43, and 50-61 are rejected under 35 U.S.C. 103(a) as being unpatentable over Piccoli et al (US Patent 6,118,037) ("Piccoli") in view of Wismann et al (WO 01/42392 A2) ("Wismann").

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6. With respect to claim 1, Piccoli discloses a method for treatment of a hydrocarbon liquid media, which includes adsorption of impurities comprising thiophenes and their higher homologs and heteroatom compounds involving nitrogen and oxygen (See column 3, lines 34-47) contained in the liquid media by a particulate catalyst impregnated sorbent at a temperature between 0°C and 150°C, separation and removal of impurities adsorbed (See column 2, lines 40-47, 62-67; column 3, lines 1-6), while separation and removal of oxides of impurities is executed by washing the particulate catalyst impregnated sorbent with a polar solvent and regeneration of the particulate catalyst impregnated sorbent is carried out with heat and/or by the blowing through a hot gas at a temperature between 100 and 200°C (See column 2, lines 58-61; column 3, lines 7-16).

Piccoli does not appear to specifically disclose a distillation step following washing, however, the invention does disclose washing with polar solvents, water, acetone, methanol, ethyl acetate or their mixtures such as hydrocarbons, paraffins from 5 to 8 carbon atom, or aromatics (See column 3, lines 14-17). Piccoli also discloses removal of liquid from the adsorbed material (See column 6, line 32, 56; column 7, lines 25-28).

Therefore, it would have been obvious to one with ordinary skill in the art at the time of invention to use any appropriate method, including distillation as claimed, to remove wash liquid from the adsorbed material.

Piccoli invention does not specifically disclose oxidation of impurities.

Wismann discloses a process similar to Piccoli for treatment of hydrocarbon liquids using an adsorbent (See title and abstract). Wismann also discloses removal of mercaptan sulfur from petroleum distillates by sorption or simultaneous sorption and oxidation (See page 1, lines 7-8). Wismann further discloses that as the mercaptan enters the pores, oxygen from air or some other source, also enters the pores and attacks the mercaptan to convert it to disulfide, which is highly soluble in oil within the pore. This allows a concentration gradient allowing influx of the mercaptan into pores and outflux of disulfides out with the distillate to produce sweet distillate product (See page 3, lines 1-6).

In view of Wismann disclosure, it would have been obvious to one with ordinary skill in the art at the time of invention to modify Piccoli invention and add an oxidizing step as disclosed by Wismann to enhance removal of mercaptan sulfur from the distillate product. It is to be noted that oxidation converts mercaptans to disulfides. Similarly, other impurities disclosed by Piccoli are expected to convert to their respective oxides.

7. With Respect to claim 11, Piccoli invention discloses using hydrocarbon streams of varying composition and origin, including fuel oil (See column 1, lines 10-11; column 2, lines 63-64; column 3, lines 48-55; column 5, lines 43-47; column 7, lines 14-19). It is to be noted that “hydrocarbon streams of varying composition and origin” encompasses all the claimed hydrocarbons.

Wismann also discloses using hydrocarbons comprising gasoline, naphtha, kerosene, diesel and fuel oils (See page 3, lines 17-19).

8. With respect to claim 18, Piccoli invention discloses that thiophene and higher homologs comprise mercaptans, benzothiophenes, thiophenes, alkylthiophenes, dialkylsulfides (See column 3, lines 38-41).

9. With respect to claims 20-23, Wismann invention discloses that oxidizing agents are selected from the group consisting of air, oxygen and hydrogen peroxide (See claim 7). Wismann also discloses that oxygen from any source can be used (See page 3, lines 1-2). Although Wismann does not specifically disclose using ozone, it is expected that any oxygen source, including ozone, should be equally effective in the oxidation process.

10. With respect to claims 26-40, 42, and 43, Piccoli invention discloses using an adsorber essentially consisting of silica gel modified with one or more metals from the elements of Group IV b, V b, VIII, I b, II b or from tin, lead or bismuth, preferably selected from zinc, iron, molybdenum, vanadium, tungsten, tin, platinum, copper and chromium (See column 2, lines 66-67; column 3, lines 1-5). Piccoli also discloses that the quantity of metals specified above is between 0.001 and 5 wt% with respect to the end catalyst.

Wismann discloses using commercially available activated carbon or catalyst impregnated carbon (See page 2, lines 25-26; page 4, lines 5-9).

Although, Piccoli invention does not specifically disclose the ratio of metals in the catalyst system, however, the invention does disclose one or more metals and the total percentage between 0.001 to 5 wt%. Also, since the ratio of metals in the finished catalyst is a result-effective variable, it is expected to be optimized by one skilled in the art by routine experimentation. See *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

11. With respect to claims 50-59, Piccoli discloses, "In the washing step, such as polar solvents, water, acetone, methanol, ethyl acetate, or their mixtures, such as hydrocarbons, paraffins with from 5 to 8 carbon atom, or aromatic, can be used" (Column 3, lines 13-16). Although Piccoli invention does not specifically disclose using ethanol, dichloroethane, dichloromethane, dichlorobenzene, however, it is to be noted that these solvents and their combinations are obvious variants of the disclosed solvents.

12. With respect to claims 60 and 61, Piccoli invention discloses that the impregnation is carried out and the water is removed by gently heating the solid under movement (See column 5, lines 8-10). Piccoli also discloses adsorption step at a temperature of 0 to 150°C and a regeneration step by means of thermal treatment in a stream of inert gas, at a temperature ranging from 100 to 200°C (See column 2, lines

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40-47). Thus, it would have been obvious to one skilled in the art at the time of invention to modify Piccoli invention and specify the temperature in the drying step. It is expected that the temperature in the drying step will be in a range, including as claimed, because it should necessarily be lower than the temperature in the regeneration step in order to maintain catalytic activity. Piccoli's heating of solid under movement should have similar effect as that of blowing a hot gas during heating.

13. Claims 19, 45 and 46 are rejected under 35 U.S.C. 103(a) as being unpatentable over Piccoli et al (US Patent 6,118,037) ("Piccoli") in view of Wismann et al (WO 01/42392 A2) ("Wismann") and further in view of Fleck et al (US Patent 2,925,381) ("Fleck").

14. With Respect to claim 19, Piccoli does not specifically disclose coal liquids.

Piccoli invention discloses host liquid to be hydrocarbon streams of varying composition and origin (See column 1, lines 10-11; column 2, lines 63-64; column 3, lines 48-55). It is to be noted that hydrocarbons from different origins comprise petroleum, and other carbonaceous liquids for example, shale and tar.

Fleck discloses a process similar to Piccoli for removal of organic nitrogen compounds from hydrocarbons using a sorbent (See title and column 1, lines 15-19).

Fleck also discloses using hydrocarbons including petroleum, coal tar oil fractions and shale oils among others (See column 1, lines 17-19, 46-50).

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In view of Fleck's teaching, it would have been obvious to one with ordinary skill in the art at the time of invention to modify Piccoli invention and use coal liquids as disclosed by Fleck, because they are supposed to be functionally similar to the liquids used by Piccoli.

15. With respect to claims 45 and 46, Piccoli invention discloses the use of 13X zeolite as a sorbent, however, the invention does not specifically disclose the pore size of the zeolite.

Fleck discloses use of 10 X and 13X zeolites having pore diameters averaging 10 Å and 13 Å, respectively (See column 3, lines 74-75; column 4, lines 1-5). Therefore, it is expected that the zeolite used by Piccoli should also have pore diameter in a range including as claimed.

16. Claims 48 and 49 are rejected under 35 U.S.C. 103(a) as being unpatentable over Piccoli et al (US Patent 6,118,037) ("Piccoli") in view of Wismann et al (WO 01/42392 A2) ("Wismann") and further in view of Stowe (US Patent 5,035,804) ("Stowe").

17. With respect to claims 48 and 49, Piccoli discloses silica gel, zeolite, and inorganic oxides, for example alumina (See column 1, lines 41-44; column 2, lines 20-30, 65-67) as sorbent support, however, the invention does not specifically disclose perlite as a support.

Stowe discloses a process of removing hydrocarbons from water by adsorption over a sorbent including perlite and sand (See abstract).

In view of Stowe invention, it would have been obvious to one with ordinary skill in the art at the time of invention to modify combined Piccoli and Wismann invention by using perlite as a support for the adsorptive process because it is expected that perlite and silica gel would be functionally similar for adsorbing impurities. Also, since the percentage of perlite in the sorbent composition is a result-effective variable, it is expected to be optimized by one with ordinary skill in the art by routine experimentation. See *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

Response to Arguments

18. Applicant's arguments filed 06/03/2010 have been fully considered but they are not persuasive.

19. In the arguments on page 7, the Applicant argues that:

Piccoli teaches removal of impurities by adsorption alone without any oxidation using a sorbent and washing the sorbent with a polar solvent to remove the impurity. There is no oxidation step. Wismann teaches specifically only the removal of odor causing mercaptans by adsorption followed by simultaneous oxidation. Wismann further teaches that upon oxidation of adsorbed mercaptans, the products formed are sulfides which being soluble in the liquid hydrocarbon

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media, actually desorb from the sorbent. This is in sharp contrast to our specification, where oxidation of impurity occurs as a necessary first step and the oxidized impurity is then adsorbed. Our teaching is thus actually reverse of what Wismann teaches. Oxidation causes the impurity compound to become significantly more polar than the rest of the hydrocarbon stream, so our process is distinguished by the fact that the impurity is very selectively adsorbed, much more so than the simple adsorption of Piccoli.

In response, it is the examiner's position that Piccoli teaches sorption (See abstract). Wismann discloses use of sorption or simultaneous sorption and oxidation (See page 1, lines 7-9). The claim requires "....oxidation and adsorption of impurities comprising thiophenes and their higher homologs, and/or heteroatom compounds involving nitrogen and/or oxygen.....". Piccoli teaches all the claimed impurities (See column 3, lines 34-47). Wismann teaches simultaneous sorption and oxidation and significant reduction in mercaptan sulfur and some reduction in total sulfur (See page 9, lines 3-4). It is to be noted that "total sulfur" should necessarily comprise thiophenes and their higher homologs. It is also to be noted that at steady state conditions, oxidation and adsorption take place simultaneously and continuously (See Wismann, page 3, lines 1-21). Oxidation is expected to cause the impurity compound to become significantly more polar than the rest of the hydrocarbon stream in the combined Piccoli and Wismann invention also as argued, because the combined invention uses an adsorbent, impurity compounds and oxidizing agent as the claimed invention. In other

words, the mechanism of oxidation and adsorption in the combined invention of Piccoli and Wismann is expected to be similar to the Applicant's invention.

20. In the arguments on page 8, the Applicant argues that:

Since the oxidation step in Wismann causes the oxidized impurity to actually solubilize in the liquid, there is no reason for a person skilled in the art to introduce oxidation taught by Wismann to the Piccoli adsorption process. It will not be obvious from Wismann's patent and Piccoli's patent to a person skilled in the art to use oxidation and adsorption to remove impurities. Following oxidation in our method, the oxidized sulfur compound (typically sulfone or sulfoxide) which is highly polar, is much more selectively adsorbed with respect to other hydrocarbons by the particulate catalyst impregnated sorbent.

The Applicant's argument is not persuasive because Wismann discloses, "As the mercaptan enters the pores, oxygen from air or some other sources, also enters the pores. When the mercaptans adsorb on the surface within the pore, oxygen then attacks it to convert it to disulfide, which is highly soluble in oil within the pore. Thus, a concentration gradient allowing influx of the mercaptan into pores and outflux of the disulfides carried out with the distillate occurs, resulting in a sweet distillate product" (Page 3, lines 1-6). It is to be noted that the Applicant's specification cites, "It is also an object of this invention to separate and remove the target elements and compounds (impurities and contaminants) by oxidizing the target element or compound. The oxidizing gas in a form of micron size bubbles is passed through the fluid stream or some other feed stream. The micron size

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bubbles of oxidizing gas are dispersed into the fluid stream containing the target elements or compounds, which are efficiently oxidized into oxides. Due to the micron size of the bubbles the surface area of the oxidizing gas is greatly increased, as a result of which the efficiency of the oxidation reaction is also greatly increased" (Applicant's specification, page 10). The Applicant further cites,

"Diffusion of components in the liquid phase requires additional residence time. Impurities are absorbed by the solid absorbent because the attraction of the absorbent surface is stronger than the attractive force that keeps the impurities in the surrounding fluid. The liquid absorption can be considered as a type of adhesion that in a thermodynamic sense takes place in the internal surface of a solid body having absorbable impurities in the liquid medium. This results in a relatively increased concentration of absorbable impurities entering the absorbent particle pores and being moved to the catalyst center by either the physical absorption due to electronegative attraction or Van der Waal's forces, or chemical absorption occurred due to the chemical or valence forces" (Applicant's Specification, page 13).

This clearly indicates that the mechanism of transfer of impurities in the combined invention of Piccoli and Wismann is similar to the Applicant's invention.

21. In conclusion, the claimed invention is *prima facie* obvious Piccoli in view of Wismann, Fleck and Stowe.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to PREM C. SINGH whose telephone number is (571)272-6381. The examiner can normally be reached on 7:00 AM to 3:30 PM.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Glenn Caldarola can be reached on 571-272-1444. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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/PREM C SINGH/
Examiner, Art Unit 1797